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## Integrated Planning and Management of land resources*

### Report of the Secretary-General

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# I. Introduction

1. In accordance with the multi-year programme of work for the Commission on Sustainable Development adopted by the General Assembly in 1997 at its nineteenth special session, the Commission, at its eighth session, will consider the topic of integrated planning and management of land resources as its sectoral theme. The present report reviews progress and problems in the development and application of integrated planning and management of land resources, in accordance with chapter 10 of Agenda 21.[1] The report examines recent developments and trends, with a focus on emerging issues, concrete approaches, improved methods and technologies, and innovations and actions at the local, national and international levels. The final section proposes priorities for future action at the national and international levels.

2. In reviewing progress with reference to the "land cluster" of Agenda 21 (chaps. 10, 11, 12, 13, 14 and 15), this report is supported by four addenda, prepared by task managers, on: combating deforestation; combating desertification and drought; sustainable mountain development; and conservation of biological diversity. The present report is closely linked to the report of the Secretary-General on sustainable agriculture and rural development.

3. The importance of integrated planning and management of land resources derives from the unprecedented population pressures and demands of society on land, water and biological resources and the increasing degradation of resources and threats to the stability and resilience of ecosystems and the environment as a whole. Global trends include expansion of human settlements and infrastructure, intensification of agriculture, and expansion of agriculture into marginal areas and fragile ecosystems. Efforts to increase productivity through intensification and technology development have in some cases led to increasing environmental and health impacts.

4. These trends are also exacerbating conflicts over access and rights to land, water and biological resources, and increasing competition between agriculture and other sectors for declining per capita land resources. They affect food security in many developing countries, global environmental balance and the well-being of present and future generations. The challenge is to develop and promote sustainable and productive land-use systems and to protect critical resources and ecosystems by balancing land, water and other resource uses, providing a basis for negotiation, participatory decision-making and conflict resolution among stakeholders, and by providing an enabling political, social and economic environment.

# II. Trends in land use

5. Changes in land use and land cover are accelerating and are likely to be the most important factor of global change in terrestrial ecosystems over the next few decades. The World Resources Institute (WRI, 1998) reports that changes to natural ecosystems are occurring on a larger scale than ever before, involving entire landscapes. Large-scale landscape changes through deforestation, expansion of agricultural land, urban and peri-urban growth, and unsustainable use of freshwater resources will largely determine the condition and extent of terrestrial ecosystems over the next few decades. Progressive fragmentation of the world's remaining undisturbed forests, urban growth in coastal areas, and the spread of cities, suburbs, roads and infrastructure over once-rural tracts will degrade the habitat and watershed values of these areas as well as affecting biodiversity.

6. The magnitude of these landscape-level changes and the increasing intensity of urbanization, industrial and agricultural production are inducing changes in global systems and cycles that underpin the functioning of ecosystems. These changes represent profound and far-reaching environmental threats. Global warming from the build-up of greenhouse gases is the best known example, with potential for large-scale disruption of natural ecosystems, agriculture, and human settlements due to changes in rainfall and temperature patterns and rising sea levels. Disruption of the global nitrogen cycle through extensive use of synthetic fertilizers, burning of fossil fuels and other activities also has the potential to change the structure and composition of terrestrial and aquatic ecosystems. Similarly, sulphur dioxide emissions that cause acid rain and thus threaten forests and watersheds can cause significant changes in those two ecosystems.

7. Several countries have suffered from excess or deficient rains, flooding or increased forest fire hazard associated with the El Niño Southern Oscillation (ENSO). The 1997-1998 El Niño was one of the most

severe in recorded history. It had a pronounced impact on weather and climate around the world and the socio-economic consequences were severe, including major losses in agriculture and forestry. Associated droughts turned humid forests into drier habitats and vegetation, thereby increasing the incidence, severity and duration of fires. Although forest fires occur every year in arid and semi-arid zones, nearly all types of forest burned in 1997-1998, even in tropical areas. Current planning efforts to address such phenomena tend to be sectoral and short-term.

8. ENSO and its associated atmospheric and oceanographic effects are not new. However, it is suspected that since the mid-1970s the frequency and severity of these cycles and other catastrophic climatic events have increased. The main concerns are changes in climatic conditions (unusual droughts, excessive rainfall, hurricanes and cyclones) and their impacts on human life, health and settlements, agricultural production, food security and biodiversity. Today, improved modelling, theoretical understanding and data allow better forecasting and monitoring of such phenomena and their consequences as well as of global climate change, but the human and economic impact can still be enormous.

9. FAO's global studies (1999) show that many developing countries continue to confront major challenges related to poverty and food insecurity, lack of productive technologies and unsustainable livelihoods. They may also be facing increased vulnerability to climatic variations and other natural disasters. Land resources in many tropical, subtropical and dryland regions of the world are seriously affected by land degradation, with severe impacts on many of the over 80 per cent of the world's population who live in countries where agriculture and land are the primary sources of livelihood. Increasing land degradation, desertification and deforestation are caused by poverty, population pressure, unsuitable land allocation, use and management, inadequate inputs, inappropriate farming and grazing practices, lack or misuse of appropriate technologies, inefficient markets and other institutional, policy and legal shortcomings (see E/CN.17/2000/6/Add.2).

10. The International Soil Reference and Information Centre (ISRIC) and the United Nations Environment Programme (UNEP) have estimated that land degradation affects around 2 billion hectares, of which 38 per cent are classified as lightly degraded, 46 per cent as moderately degraded, 15 per cent as strongly degraded and 0.5 per cent as extremely degraded. By region, Asia has the highest percentage of the world's degraded lands (38 per cent), followed by Africa (25 per cent), South America (12 per cent), Europe (11 per cent) North America (8 per cent) and Australia (5 per cent). In sub-Saharan Africa and in some other regions, efforts to increase crop production and develop cash crops have also had negative effects. These include reductions in fallow periods, soil nutrients, organic matter, soil fertility and permeability. Nutrient depletion has a severe impact globally, and research by the International Fertilizer Development Centre (IFDC) in sub-Saharan Africa showed annual fertility losses exceeding 20 kg/ha of nitrogen alone.

11. Processes of land degradation include soil compaction, soil and water erosion, soil fertility decline, reduction of biomass, salinity, loss of soil biodiversity and other physical and chemical alterations as a result of inadequate drainage and misuse of soils, as well as loss of soil biodiversity. Average yield reductions are estimated at 8 per cent for Africa, with up to 50 per cent loss of productivity in certain areas. The resulting loss of habitats and declining capacities to support animal and plant life trigger genetic erosion of local plant and animal species and varieties, directly affecting the food security and health of local populations, especially the poor, who rely on diversity to meet their multiple needs (see E/CN.17/2000/6/Add.4).

12. FAO estimates that between 1980 and 1990, the global forest area decreased by 180 million hectares, and from 1990 to 1995, by another 56 million ha. In the developing countries, annual loss of forests was estimated at 15.5 million hectares during 1980-1990, with an estimated annual loss of forest cover of 0.7 per cent in Africa, 0.6 per cent in Asia and 0.5 per cent in South America (see E/CN.17/2000/6/Add.1). It is also estimated that about 30 per cent of the worlds' irrigated lands, 40 per cent of rainfed agricultural lands, and 70 per cent of rangelands have already been affected to some extent by increased land degradation. Out of some 260 million hectares of currently irrigated land, about 30 per cent are also affected by varying degrees of salinity. These figures are very general, since there is inadequate monitoring worldwide of land degradation (see E/CN.17/2000/6/Add.2).

13. Land degradation affects freshwater availability and quality and alters the water regimes of rivers and

streams, groundwater recharge and flooding. The effects of changing land use and land degradation vary from one river system to another. Upstream/downstream linkages are very complex and not yet fully understood, despite detailed studies in major watersheds. Potential impacts include silting of reservoirs and estuaries, lowering of groundwater levels, intrusion of salt water into aquifers, pollution of water by suspended particles, and salinization. Besides affecting the productive potential of the land, degradation may indirectly affect aquatic ecosystems and their biodiversity and lead to reduced capacity to support human livelihoods through fishing and related activities. At the same time, unsustainable patterns of freshwater use can lead to severe processes of land degradation. For example, overuse of groundwater beyond its natural rate of recharge can lead to land subsidence, which is a particularly serious problem in several urban areas.

14. Many inland water ecosystems (river basins, lakes, wetlands and marshes) and their fishery resources and biodiversity, on which large populations rely, are seriously threatened by industrialization, urbanization, mining, deforestation, agro-chemical use and sediments in runoff from agricultural lands. It is estimated that 26 per cent of the world's wetlands have been lost: some 60 per cent in Europe and North America, 27 per cent in Asia, 6 per cent in South America and 2 per cent in Africa. This is due largely to conversion to agriculture, especially for rice production in Asia, or diversion of water for agriculture and aquaculture. The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (RAMSAR Convention) is catalyzing international efforts to protect wetlands in coordination with other related agreements.

15. Some lands have been rehabilitated and the natural resources restored through concerted efforts and investments, while others have regenerated through natural processes during long periods of abandonment. Some grazing lands affected by desertification have recovered from drought and overgrazing, although others have been further degraded due to mechanized cultivation and increased livestock pressure around water points (see E/CN.17/2000/6/Add.2). The second International Conference on Land Degradation, organized by the Government of Thailand, with support from FAO, the International Board for Soil Research and Management (IBSRAM) and the International Union of Soil Sciences (IUSS) (Khon Kaen, Thailand, January 1999), recommended systematic monitoring of land degradation and rehabilitation, with a focus on fragile ecosystems and areas with particular land use pressures. The Conference also recommended use of agreed guidelines and a core set of indicators on land degradation.

# III. Information on land resources

## A. Information systems

16. Technological advances have made possible considerable progress in developing databases on land resources and land use, in processing and integrating information from multiple sources (environmental, social and economic), and in developing more effective analysis and planning tools. Mechanisms and tools have been developed to make integrated information systems more accessible, facilitating the involvement of multiple stakeholders at different levels of planning and management. A further advance is the use of the "ecosystem approach" as a framework for action under the Convention on Biological Diversity and as a strategy for the integrated management of land, water and biological resources.[2]

17. FAO, in collaboration with member countries and partner institutions, has developed specialized information systems relating to agriculture, forestry and inland fisheries. The systems are being continuously expanded and upgraded to address issues at global, regional, national and subnational scales. Guidelines for collecting and assessing information and monitoring and reporting on the state of the world's land and water resources are being disseminated, tested and applied in several countries. FAO's recently digitized Land and Water Media Series contains a digital soil map of the world; the World Soil and Terrain Database (SOTER); the World Overview of Conservation Approaches and Technologies (WOCAT);[3] and an information system on water in agriculture and rural development, with emphasis on irrigation and drainage (AQUASTAT).

18. Other institutions, including UNEP, United Nations Development Programme, the World Bank, United Nations Educational, Scientific and Cultural Organization, Organisation for Economic Cooperation and Development, United Nations Conference on

Human Settlements, the World Resources Institute (WRI), the World Conservation Union (IUCN), the World Conservation and Management Centre (WCMC) and ISRIC, are also involved in building information bases, collecting data and preparing digitized maps for particular subject areas or regions. The Africover Programme, since 1994, has been generating a uniform geo-referenced land-cover database at a scale of 1:1 million to reinforce capacities and provide geographic information and statistics for early warning, forest and rangeland monitoring, catchment management, biodiversity, climate change, and other natural resource management purposes. Somalia and Kenya have now been mapped; the East African subregion should be completed in two years; and partnerships and institutional mechanisms are being established for other subregions. One area where there is still a major lack of information is the status of biological diversity.

19. FAO's Agro-Ecological Zoning (AEZ) methodology and supporting software and modelling tools are being constantly updated and adapted to take into account new issues and country situations as well as new concepts, processes and technological developments. They are being widely applied for assessment of land potential and constraints, development planning and land management studies at the global, regional, national and subnational levels. The Bangladesh Agricultural Research Council, with FAO support, has established a national geographic information system (GIS) and an AEZ database, providing a natural resource database and land-evaluation system unrivalled in the developing world. The Council is now capable of advanced agricultural planning and policy scenario development, taking into account agricultural, environmental and socio-economic information and knowledge.

20. An eco-regional approach is used by IBSRAM and by several centres of the Consultative Group for International Agricultural Research Centres (CGIAR) to assist in resource inventory and management, research and technology transfer. This approach, integrating biophysical and socio-economic factors, is used to guide management of natural resources, identify priority problems for research and develop technologies best adapted to local conditions. More attention is being paid worldwide to interactions among abiotic and biotic resources and the ecological functions that characterize a stable and balanced ecosystem, such as nutrient and carbon cycling and the hydrological cycle.

21. Support is provided by United Nations agencies and international partners in developing tools and capacities for integrated approaches to ecosystems and land-use systems, such as river basins, wetlands, mangroves and biosphere reserves. An example is the transboundary FAO Nile River Programme and its Lake Victoria Water Resources component, which is developing operational information bases and advanced systems of monitoring and forecasting of water resources availability, taking into account changing conditions in the watershed. Other capacity-building programmes and initiatives focus on issues such as land vulnerability, food insecurity assessment, drought mitigation, and environmental accounting.

## B. Land-use analysis

22. Knowledge of how land resources are used and by whom remains limited in many countries. Land tenure arrangements as well as gender and other socio-economic differences are determinants of access to and use of land and water resources. Resource-poor households, frequently female-headed, are often pushed onto increasingly fragile lands through displacement and fragmentation. Insecurity of tenure discourages investments in land improvements (terracing, drainage, soil restoration etc.) since the user may not reap the long-term benefits, and the increased land value makes it more attractive for others to seize.

23. National statistics and censuses provide valuable and readily available data and information, although natural resources data are rarely gender-disaggregated and are usually available for administrative areas that do not match natural land units. The situation is improving through increasing availability of satellite remote sensing data supplemented by aerial photography, geographic information systems (GIS) and geographic positioning systems (GPS). These make possible the integration of geo-referenced data on land and other natural resources with information on socio-economic factors.

24. Changes in land use and land cover are being studied as an important element of global environmental change, along with the associated reduction in biodiversity and changes in atmospheric composition, especially $CO_2$ concentration, and in

climate. The International Geosphere-Biosphere Programme (IGBP), established by the International Council for Science (ICSU), and the Global Terrestrial Observation System (GTOS) are monitoring such global changes.

### C. Indicators of sustainable land use

25. The international community is working on criteria and indicators for sustainable development. Several interinstitutional thematic working groups are developing indicators under the Commission's work programme. In 1997, the Scientific Committee on Problems of the Environment (SCOPE) issued a report on indicators of sustainable development offering diverse perspectives and approaches, and an ongoing OECD project in this area includes national accounting frameworks. Indicators are being developed for sustainable forest management (the Centre for International Forest Research-CIFOR, FAO); biological diversity (Convention on Biological Diversity secretariat, UNEP, UNESCO, OECD, Diversitas), desertification (United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa), the Sahara and Sahel Observatory, FAO, OECD) and land quality. More than 150 countries are participating in regional and eco-regional processes to develop and implement national-level criteria and indicators for sustainable forest management.

26. An international land quality indicators programme was established in 1994 to promote integration of production and environmental management and more sustainable use of land, water and biological resources. The programme, with the participation of the World Bank, FAO, UNDP, UNEP and the CGIAR, focuses on land-use pressures, land degradation, and soil and water conservation, as well as policy-related questions on sustainable land management.[4]

## IV. National Policies

### A. Land-use planning

27. Improved knowledge of land resources and the environmental and social problems associated with land use, as reviewed above, is leading policy makers, communities and individuals towards better land management. Land is no longer perceived as a resource to be developed and used for economic purposes only but as an asset to be maintained and improved for the well-being of present and future generations, an essential part of the political, social and cultural fabric and of ecological balance.

28. Efforts so far are inadequate to meet the need for land conservation and rehabilitation and the increasing threats to ecosystems and resources, especially in developing countries. Several countries have prepared national action plans to combat desertification, and several regional bodies, particularly in Africa, have drafted regional action plans. However, in many cases, financing for the implementation of these plans has not materialized. Recent discussions under the auspices of the Convention to Combat Desertification (Recife, November 1999) could not reach agreement on the magnitude and modalities of financial resource mobilization. Concerning biodiversity, programming work has proceeded with support from the Global Environment Facility (GEF) and its implementing agencies, but few developing country action plans are operational.

29. Macroeconomic and lending policies are still often biased in favour of development activities in urban and peri-urban areas and on agricultural lands with high potential. In recent years, international funding institutions have focused sustainable development efforts on global concerns such as climate change, deforestation, pollution and biodiversity, and less on sustainable agriculture and desertification. The share of agriculture in official development assistance has been decreasing steadily (e.g., from 20 per cent to 11 per cent over five years in the case of multilateral development banks), while agriculture remains the major user of land and water resources and of the biodiversity utilized by humans, and must meet the increasing demand for food and other products.

30. In many countries, policies for sustainable land use remain fragmented and incomplete, generally because of institutional barriers, conflicting mandates, and the prioritization of economic over social and environmental goals and of short-term development over long-term conservation goals. The national strategies and action plans catalyzed by the conventions on biodiversity, desertification and climate change need to be integrated with sectoral plans into a comprehensive national land resources strategy.

Moreover, sectoral codes, legislation and procedures governing planning processes and regulations for human settlements, agricultural lands, forest lands and protected areas need to be harmonized.

31. A number of countries have formulated land-use strategies as part of their national Agenda 21 and environmental action plans, often in cooperation with the World Bank and other international organizations (e.g., Madagascar). Initially some plans focused on delineating areas for protection as nature reserves, critical watersheds and other environmentally important areas, or on addressing pollution problems. Gradually the scope has expanded to encompass sustainable land-use plans in a wider geographical and longer term perspective, including assessment of future land resource requirements and identification of areas with critical land degradation hazards and water-use problems. Comprehensive strategies for sustainable land use now address agricultural lands, forest lands and urban and peri-urban areas, problems of degradation, and land and water use conflicts.

## B. Coordinated, decentralized and participatory land management

32. At the national level, three trends can be observed with regard to the multisectoral and multilevel integration of land-use planning processes:

(a) The development of more comprehensive and longer term national strategies for sustainable land use (e.g., Costa Rica, Mexico, China);

(b) Growing decentralization and devolution of power in land-use planning and management (e.g., Mali, Brazil, Finland, Denmark);

(c) Broader consultation and public participation in land-use planning and decision-making (e.g., France, Burkina Faso, Senegal).

33. Land-use strategies and planning guidelines are generally the result of cooperative work among several ministries and agencies, sometimes through a national land-use council, or through the merger of ministerial councils dealing with land resources (e.g., Australia). In several cases, a national land-use policy act has been enacted based on such cooperation. Interministerial and other multi-institutional mechanisms often monitor progress with respect to strategies and guidelines. Such mechanisms can assist in conflict resolution among sectors or regions or groups of land users. In some cases, diverse institutions and non-governmental organizations are invited to participate in these multisectoral bodies. In Mexico, for example, a Council for Sustainable Rural Development coordinates the work of diverse institutional bodies and non-governmental organizations relating to agrarian reform, rural and agricultural development, tourism, public education and governance.

34. Efforts are under way in many countries to harmonize legal provisions governing land use and incentives for sustainable land management and to promote a longer-term development perspective. In April 1998, Costa Rica adopted a law for land use, soil conservation, and soil management. Slovakia and Honduras have recognized the need for greater cooperation among central administrative bodies as problems of coordination have limited their capacity for integrated planning and sustainable use of land resources. In Honduras, the reform process is developing a series of harmonized laws on forest and water resources and land-use planning. In some countries, land-use planning responsibilities have been consolidated, as in Lithuania, which in 1998 merged its Environment Protection Ministry and Ministry of Construction and Urban Development.

35. The degree of devolution of land-use planning responsibilities from central to regional, provincial or district authorities varies widely among countries, depending on their national circumstances and institutional set-up. A growing number of OECD countries have delegated substantial responsibility for land-use planning to regional or provincial authorities and to municipalities, (e.g., Finland, Denmark). Some regional authorities are also responsible for issuing regional land-use policy statements (e.g., New Zealand) and land-use legislation and regulations (e.g., Canada). In such cases, regional and local authorities are setting up multisectoral mechanisms better to respond to multiple stakeholder demands (e.g., the coordinated resource management mechanisms in the United States of America). In Honduras, agriculture, forestry and marketing institutions have been decentralized, and the training of local staff is ongoing. Detailed planning is in the hands of local authorities, which promote citizens' participation, while plans prepared by the regional authorities to preserve landscape values and ecological sustainability are ratified by the Ministry of the Environment.

36. Many examples have been reported of positive impacts of public participation in land-use planning, including averting mistakes in decision-making, avoiding conflicts among land users and preventing irreversible damage to natural resources and the environment. Institutional decentralization is generally considered a prerequisite to public participation in planning and decision-making, but institutional decentralization has not always resulted in greater public participation. Regional and municipal authorities and their bureaucracies are not always prepared to adopt processes involving multiple stakeholders. The influence of major groups, non-governmental organizations and the media have induced a number of local, regional and central authorities gradually to change their attitudes and procedures and to take a more pro-active role in ensuring public participation.

37. Many countries have introduced environmental impact assessment procedures that entail consultations with local populations during project identification and the initial planning stages, as well as later in the process. Early involvement of non-governmental organizations in this process appears to help avert land-use conflicts.

38. In contrast to land-use planning, which entails a complex process of integration, vertically and horizontally, at several levels (national to local), the integrated management of land resources is mainly an undertaking at the community and district levels. National or regional authorities concern themselves primarily with larger ecosystems or physical units, such as watersheds, valley bottoms, wetlands and biodiversity "hot spots". Central authorities are also concerned with monitoring land use through land administration systems and support activities in capacity-building and technology transfer.

39. In the past, land resources, land use and socio-economic conditions were surveyed separately. More recently, integrated community-oriented approaches have been introduced through rapid rural appraisal techniques, then participatory rural appraisal and participatory learning and action, and most recently, through the participatory landscape/lifescape appraisal (PLLA) approach.[5] The latter is done at landscape scale and focuses on the interaction of human activity with the biophysical environment. A similar approach based on local development and local land tenure identification, called *gestion des terroirs*, is widely used in francophone Africa, including Burkina Faso, Cote d'Ivoire, Mali and Niger. In addition to gathering information, these methods involve collective diagnostic processes that identify crucial linkages between people and their land and major constraints on natural resource use, employment, food security and agricultural sustainability.

40. The successful Australian Landcare model provides a large-scale example of the involvement of stakeholders in improving natural resource management from local to national levels. Its application in some key watersheds in Asia, with the support of the International Centre for Research in Agroforesty (ICRAF), is promising for promoting conservation farming and agroforestry in the tropics. The Farmer Field School is another successful approach, initially applied to integrated pest management for rice in Asia, and leading to more sustainable practices and technologies as well as important policy changes. Now used for wider land husbandry applications, it is being disseminated and adapted in parts of Asia and Africa to introduce sustainable land and water management practices, (e.g., Kenya, Viet Nam and Zambia).

41. Other field projects using participatory and ecosystem approaches have focused on problems of poverty alleviation, food security and environment in areas vulnerable to land degradation, introducing sustainable systems of land and water management. Examples include:

(a) Conservation agriculture systems introduced, adapted and used by millions of farmers on tens of thousands of hectares in diverse country conditions with the support of local non-governmental organizations, FAO and other institutions (e.g., in Brazil, Honduras, Kenya, Zimbabwe, United States, Australia, several European countries);

(b) The Plan Sierra eco-development project in the central cordillera of the Dominican Republic, with the support of national non-governmental organizations, CARE and the World Food Programme (WFP);

(c) The sustainable agriculture and environmental rehabilitation programme (SAER) in Ethiopia, with the cooperation of the Economic Commission for Africa (ECA) and UNDP, focusing on arid, fragile and wetland ecologies;

(d) Biodiversity conservation and integrated planning and management of land resources through the UNESCO World Network of Biosphere Reserves (currently 357 sites in 90 countries) and the supporting Man and Biosphere Programme (MAB).

42. One aspect of land management that is receiving growing attention from local communities and governments is waste management and recycling. Land type and local surface and groundwater conditions are increasingly taken into account in selecting sites and techniques for waste disposal. However, while some countries have introduced more stringent regulations and land zoning, in many others waste disposal remains a major cause of land degradation. Uncontrolled waste disposal is introducing a growing amount of pollutants and contaminants into ecosystems and food chains, adversely affecting food safety and health. Decision-making mechanisms for waste management, which exist in many urban areas, including civil society/government partnerships, generally do not exist in peri-urban or rural areas. Such partnerships could prove valuable, especially in areas where resources are limited and population pressures high, and in areas facing severe pollution problems.

43. While decentralized and participatory decision-making promotes more effective and balanced land-use planning, there can be considerable delays in finalizing and implementing the plans because of the many steps involved in their clearance. Decentralization of land-use planning is often a source of conflict among the diverse local, regional and national institutions involved, particularly when plans involve combined funding from different sources. Despite the advantages of devolution, many countries therefore retain a large degree of centralization in land-use decision–making. Only a few countries have largely delegated land-use decisions (e.g., to the *Länder*, in Germany; the provinces, in Canada; and the states, in the United States), while retaining direct responsibility for some critical land areas. Responsibility for monitoring and control is often also retained centrally (e.g., the Observatory for Land Use Planning in Greece). Some central authority is also needed to address land-use impacts beyond the boundaries of a community. Since natural management units such as watersheds, river basins and other sensitive areas requiring protection often cross administrative boundaries, higher-level processes for dialogue and decision-making are often required.

44. In some cases, decentralization has generated conflicts between central government and local communities, which have delayed public and private investment and project implementation. Furthermore, decentralization has not always meant equitable representation for all stakeholders. Giving decision-making power over natural resources to community leaders runs the risk of reinforcing local inequalities and further marginalizing disadvantaged groups, such as female-headed households, pastoralists, or recent immigrants.

## C. Land tenure reform

45. There is a growing awareness of the need to improve land tenure institutions in many countries, but the challenges are great. The former centrally planned economies with socialist Governments have had to create or recreate entire land registries and property cadastres. There is an equally large task of ensuring legal and social rights for traditional "owners" and users of areas with various forms of communal tenure. The fact that areas under customary tenure are often in fragile arid, mountainous or forest ecosystems has added a special sense of urgency to this issue (see E/CN.17/2000/6/Add.3). Furthermore, tenure security does not by itself ensure sustainable land management by the land user, as shown by the mixed results of some land reforms. The problem is not merely providing tenure security but also of providing users with the capacity to use their land-tenure rights in ways that enhance both sustainability and rural development. Land tenure reform and development are part of the process of effective decentralization.

46. Overlapping informal, customary, public and private land-tenure regimes pose considerable difficulties for the registration of land-tenure rights in a single system that adequately reflects local and indigenous rights. Moreover changes in land tenure may alter the behaviour of individuals and local communities, leading to land degradation — for example, overgrazing following settlement of nomads — and over-exploitation when communally managed lands become public lands with free access. An enabling environment that allows effective stakeholder participation in land-use planning and management plays a key role in promoting productive and sustainable land use by all resource users. The international Popular Coalition to Eradicate Hunger

and Poverty works to empower the rural poor by building alliances for land reform in order to increase access of the poor to productive assets (land, water and common-property resources) and to broaden participation in decision-making at all levels.[6]

## V. International programmes

47. Further to the integrated approach to land-use planning and management advocated in chapter 10 of Agenda 21, Governments have over recent years adopted several international agreements and action plans to address different aspects of sustainable and equitable use of land resources. Besides the conventions on desertification, biodiversity and climate change, there are the commitments and plans of the International Conference on Population and Development (Cairo, 1994); Global Conference on the Sustainable Development of Small Island Developing States (Bridgetown, 1994); World Summit for Social Development (Copenhagen, 1995); Fourth World Conference on Women (Beijing, 1995); Second International Conference on Human Settlements (Istanbul, 1996); and World Food Summit (Rome, 1996). Those international agreements have stimulated international and national policies and programmes promoting integrated land-use planning and management. The policies and programmes promote not only information exchange and global monitoring but also the creation of an enabling environment, in particular through:

(a) Policies in many countries for increased public participation, including participation by women and indigenous groups, and enlarged democratic decision-making processes;

(b) Increasing attention in environmental policies and plans to sustainable management of land resources beyond protected areas and to control of pollution from various land uses;

(c) Institutional decentralization and privatization measures that increase opportunities for stakeholder participation;

(d) Streamlining of land-use codes, investment codes and land-tenure legislation in order to improve land zoning, land resource protection, land-tenure security and equity, while developing efficient and sustainable land markets, including the development of land legislation and administration systems that recognize the rights of women and local and indigenous communities.[7]

48. The conventions on climate change, biodiversity, desertification and wetlands all contain elements for improving land use and management. Since the conventions often apply to the same areas, their implementation can provide greater benefit if policies combine multiple objectives — for example, improvements in household food security and income, land and water conservation, carbon sequestration, and biodiversity conservation. One example of greater benefit is improved land management through conservation tillage, which has shown exceptional rates of spontaneous adoption in several Latin American countries and in Australia. Conservation tillage not only has positive effects on soil productivity, biodiversity and carbon sequestration but also provides benefits in the form of reduced inputs and labour, especially of women, and increased soil organic matter and soil biota, leading to improved structure, permeability, moisture-holding capacity and stability. Conservation tillage also improves the cycling and storage of nutrients and their gradual release to crops. Over a few years, this results in enhanced land productivity and contributes to more sustainable livelihoods.

49. FAO and UNEP have continued to develop a body of methodologies and guidelines for land-use planning, drawing from a wide range of expertise and new national and local experiences. Following workshops and consultations with representatives from over 30 countries and international institutions, including the European Community (EC) and some CGIAR centres, an international framework of principles and guidelines for integrated land-use planning was published in *Negotiating a Sustainable Future for Land*.[8] Another publication, *The Future of Our Land: Facing the Challenge*[9] provides a comprehensive methodology and detailed procedures for the whole planning process. FAO has also elaborated specific guidelines for critical areas such as coastal areas and steep lands and hilly terrain in the tropics.[10]

50. A number of international water resource management programmes also have begun to address environmental and social concerns related to land use, including UNESCO's International Hydrological Programme (IHP); the World Bank's Water Environment programme; IDRC's People, Land and

Water programme; WMO's Hydrology and Water Resources programme; the CGIAR System-wide Initiative on Water Management (SWIM); and the Eco-regional Programme on On-farm Water Husbandry in West Asia and North Africa of the International Centre for Agricultural Research in Dry Areas (ICARDA). The International Research and Training Centre on Erosion and Sedimentation (IRTCES) in China is promoting knowledge exchange and cooperation in the study of erosion and sedimentation problems, working with the FAO/UNDP Farmer-centred Agricultural Resources Management (FARM) programme for participatory management of land resources in watersheds in Asia.

51. The CGIAR system has developed several cooperative eco-regional programmes which focus on land degradation and take an integrated watershed management approach. A framework of eco-regions is used to facilitate understanding of land-use problems, identification of research priorities, and selection, development and transfer of the most appropriate technologies, in cooperation with the local populations. In 1999, the CGIAR centres and representatives from national agricultural research systems and non-governmental organizations developed a consensus on approaches to integrated natural resources management (Bildeberg, 1999), recognizing the need to integrate commodity-oriented research within the wider context of responsible and broad-based management of land, water, forest and biological resources, in order to sustain agricultural productivity and prevent degradation of productivity.

52. Choosing the most appropriate land rehabilitation and conservation techniques for particular situations is facilitated by the global information system WOCAT, which provides guidelines, case studies and assessments of a wide range of land conservation technologies and institutions throughout the world.

53. As regards land administration systems, the International Federation of Surveyors (FIG), in cooperation with United Nations agencies and the participation of other institutions and non-governmental organizations, recently convened a workshop on land administration for sustainable development (Bathurst, Australia, October 1999). The resulting Bathurst Declaration and workshop recommendations provide important advances and guidelines on a wide range of land-related issues such as land tenure, land valuation and land markets and suggestions for redesigning land administration systems.

# VI. Priorities for future action

## A. National policies

54. A number of challenges and priorities emerge from the above review of developments in the implementation of chapter 10 of Agenda 21. Other developments are reported in the four addenda to this report, on desertification, deforestation, mountain development and biodiversity. The main recommendations of Agenda 21 remain valid, and the know-how and tools for achieving sustainable management of land resources have improved, but progress has been uneven and incomplete.

55. Obstacles to the implementation of Agenda 21 with respect to land resources are diverse and vary among countries. Limiting factors include:

(a) Lack of an enabling environment, including legislative frameworks, supportive policies and socio-economic conditions, and the mixed effects of trade liberalization and globalization;

(b) Inadequate definition and enforcement of property rights and insecurity of land tenure;

(c) Institutional barriers and sectoral interests;

(d) Lack of financial and technological means, human resources and skills.

56. At the national level, the challenges and priorities are to remove these basic constraints and pursue the objectives set out in Agenda 21 concerning land resources. For the United Nations system and other international and bilateral development organizations, the challenge is to improve support for these national endeavours.

57. Addressing the threats to the most valuable land resources for agriculture, forestry, tourism, biodiversity and ecological protection should be a top priority, in many cases taking precedence over efforts to rehabilitate degraded marginal lands. Land-use planning, land zoning and land-use regulations should provide the necessary controls and prevent the loss of valuable and sometimes unique resources. The precautionary approach to land-use and management

should be applied to ensure the protection of threatened land resources for current and future generations.

58. Trade liberalization is having mixed results on sustainable land use, depending on policies, socio-economic conditions and institutional structures. Declining prices for agricultural commodities, open markets, debt crises and exchange-rate movements have had direct and indirect effects on land resources. In some cases, trade liberalization is leading to local or foreign investment in non-sustainable land uses and inappropriate production practices, without due regard to the risks of land degradation and negative social effects. Globalization of trade and financial flows increase the need for national regulatory frameworks for land registration and use and for standards and methods of land evaluation and risk assessment.

## B. Focusing on "hot spots" of land degradation

59. In setting priorities for land-use planning and management, it may be useful to identify and assess "hot spots" of land degradation as a focus for the limited resources available.[11] A focus on critical problems, on areas where population pressure is causing land degradation and conflict, and on "critical interfaces", or boundaries between different land uses, is essential in order to avoid irreversible damage and major socio-economic problems. Within the broad range of issues addressed in Agenda 21 and related conventions, the main critical areas that stand out as future challenges and priorities for land-use planning and management are listed below:

### 1. Agricultural lands

60. The following agricultural lands require attention:

(a) Prime agricultural lands, especially in food-deficit countries, facing accelerated encroachment of settlements, industry and transport infrastructure, and degradation from inadequate management of wastes, effluents and pollution;

(b) Areas where intensive agriculture is causing land, air and water pollution and where badly managed irrigation causes waterlogging, salinization, groundwater depletion and saline water intrusion;

(c) Areas where accelerated agricultural development and land consolidation is causing loss of rural landscapes, biodiversity and wildlife habitats, reducing the quality of surface and ground water, and causing siltation and pollution in neighbouring wetlands, inland waters and coastal zones;

(d) Areas with conflicting demands for scarce water resources among human settlements, irrigated agriculture and other users;

(e) Areas where land tenure conditions hinder the development of sustainable farming systems and are a significant cause of land degradation;

(f) Major watersheds and river basins where land degradation is leading to changes in the hydrological regimes of surface and ground waters, silting of water bodies, flooding, and disruption of the ecological balance of wetlands.

### 2. Forest lands

61. The following forest lands pose critical problems:

(a) Forest areas with unsustainable exploitation for wood and non-wood forest products including exploitation of wildlife and unsustainable tourism and recreation;

(b) Natural forests being cleared for forest plantations, unsustainable agricultural systems, uncontrolled settlements, exploitation of mineral resources, and road and infrastructure development;

(c) Scarce forest and tree resources of arid and semi-arid areas that are being depleted for fuelwood and building materials;

(d) Rare remnant natural and old-growth forests that are host to important biological diversity;

(e) Forest areas affected by recurrent forest fires, particularly those near human settlements;

(f) Urban and peri-urban forest lands degraded by recreation activities, waste disposal, air pollution and fuelwood collection, and encroached upon by settlements.

### 3. Mountain areas

62. The following mountain areas require attention:

(a) Critical watersheds in mountain areas where deforestation, overgrazing, infrastructure development, tourism, and inadequate terracing and other agricultural

practices are causing destructive floods, landslides and avalanches;

(b) Sloping fragile lands degraded by erosion and deforestation and where land tenure conditions and lack of support services and infrastructure prevent poor and indigenous farming communities from making a sustainable living.

#### 4. Desert margins and arid and semi-arid areas

63. The following areas pose challenges for planning:

(a) Rural and peri-urban areas where people are unable to sustain a living due to land tenure constraints and overexploitation of resources, including overgrazing, fuelwood harvesting, hunting of wildlife, habitat destruction, and soil contamination from oil production;

(b) Areas where human settlements and transport infrastructure threatened by sand dune encroachment are recurrent sand storms;

(c) Areas where fragile land and limited water resources are being degraded and depleted, especially where there are high population pressures on inland water ecosystems in drylands and where hitherto nomadic populations have settled.

#### 5. Protected areas

64. The following areas require priority attention:

(a) The boundaries between protected areas and agricultural lands or tourist resorts, particularly where lack of buffer zones, insufficient control by local authorities and lack of participation by neighbouring communities in nature reserve management exacerbate conflicts between farmers, fishers, herders and those managing protected areas;

(b) Areas where wildlife population pressures cause severe land degradation in protected areas, with impacts on surrounding agricultural lands;

(c) Important wetlands and critical coastal areas and critical land resources in small island developing States.

#### 6. Urban and peri-urban lands

65. The following lands are of concern:

(a) Areas of rapid uncontrolled settlement, especially informal settlements in peri-urban areas, lands subject to floods and landslides, areas where wastes and effluents accumulate, and areas without adequate water supply, sanitation systems or other services;

(b) Areas where peri-urban and urban agriculture, industry and transport compete for resources (land, water, energy) and cause environmental degradation, including air and water pollution, noise, and other health hazards;

(c) Land and water resources in rural areas subject to almost irreversible degradation by uncontrolled disposal of urban and industrial wastes.

66. Countries should undertake surveys of such "hot spots" of land degradation, assessing the degree and rate of degradation, the risk of further degradation, and the options and costs of preventing further degradation and rehabilitating degraded land. On the basis of such surveys, countries should establish priorities for protection and rehabilitation measures.

67. The multiplicity of critical areas and hot spots within each of the land types is a challenge in itself in setting priorities. This challenge is particularly acute in coastal areas and small islands, where land/sea interfaces are critical areas for many countries as a result of increasing populations with many competing demands for land and water. Those coastal areas and small islands are also frequently exposed to natural disasters, including cyclones and tsunamis, which require emergency planning. Opportunities for increasing the efficiency of resource use include waste-water reuse for fish production and fish farming in rice fields or other irrigation schemes.

## C. Organizing for action

68. In order effectively to protect and manage land resources, comprehensive, accurate and up-to-date information on the current status and trends of land resources, including use, tenure and degradation, should be assembled and integrated into geographic information systems (GIS) that are easily accessible and compatible with conventional statistics. Until problems can be demarcated, assessed and explained, with clear evidence, it will remain difficult to mobilize institutions to act and stakeholders to participate in finding solutions.

69. Clear institutional responsibilities should be assigned for various aspects of land-use planning and management, and mechanisms developed to overcome institutional barriers between agencies at both the central and local levels. A governmental agency should be designated to have overall responsibility for policy-setting and coordination; specific and complementary responsibilities should be defined for other concerned agencies; and inter-agency coordination mechanisms and procedures, with provision for public participation, should be established to ensure coordination, cooperation and participation at all levels.

70. With these basic institutional structures in place, it will be possible to undertake comprehensive reforms in land-use policies, harmonize land-use codes and regulations, develop fiscal and other policy instruments in support of sustainable land management, and develop integrated systems of land planning and management. Above all, it will be possible for central institutions to undertake coordinated action for decentralization and to mobilize funds for investment and support services. Institutional reform and intersectoral cooperation may be needed to coordinate two separate and parallel processes of planning: conventional socio-economic planning based on a framework of administrative units; and land-use and water-use planning based on land units, watersheds and eco-regions.

71. Countries should review property rights and land tenure systems with respect to sustainable land management. Where necessary, programmes should be undertaken to ensure well-defined and enforceable property rights, improve land administration systems and land markets, and improve access to land and security of tenure, in particular for disadvantaged groups, including women, the poor, and indigenous people.

## D. International cooperation

72. Compared with some other natural resources and environment problems (e.g., climate, air quality, water management, marine resources and biodiversity), the international dimensions of integrated planning and management of land resources are relatively limited, since land is a fixed resource under national jurisdiction. The main need for international cooperation therefore is for Governments and people to share information and experience in the planning and management of their land resources and to help each other in solving common problems.

73. Trade liberalization and globalization may provide increased impetus for international cooperation on land-related matters, although they may also create problems as national land markets become more open to foreign buyers and investors. There is a need for further study of the impact of trade liberalization and globalization on land use and sustainability at the local, national and global levels.

74. Modern technologies in various sectors have growing capacities to damage land resources when misused as well as posing risks to food safety, health and the environment. Since these risks are common to many countries and may have transboundary effects, international cooperation is needed to assess them and define ways to reduce them.

75. Past international experience in natural resource and environmental management offers a number of examples of cooperative frameworks that could serve as models for addressing land degradation. These models range from charters (e.g., World Soil Charter), codes of conduct (e.g., on pesticides), international undertakings (e.g., on plant genetic resources for agriculture), and international decades (e.g., on hydrology), to action plans (e.g., Leipzig Action Plan on Plant Genetic Resources, the Soil Fertility Initiative and the action plans in the Convention to Combat Desertification). Funding mechanisms that could serve as models include GEF and the global mechanisms in the Convention to Combat Desertification. Important resource savings and increased effectiveness can be achieved by coordinated implementation of the conventions on climate change, desertification, biodiversity and wetlands at both the national and international levels.

76. Changes in land use, and in particular changes in forest cover, are important issues in the implementation of the Kyoto Protocol. If forests are included under the Clean Development Mechanism of the Protocol, there is a need to define how they should be treated. Treatment of afforestation, reforestation and deforestation under the Protocol could have important impacts on forests, on biodiversity, on surrounding ecosystems, and on people dependent on those resources. The Intergovernmental Panel on Climate Change is preparing a special report on land use, land-use change and forestry, to support discussions on the

carbon sequestration and emission potentials of forests and other land uses. It is important that mechanisms adopted at Kyoto take into account the full range of their impacts on land-use management, and not only the climate change effects.

77. An international cooperative programme on integrated land-use planning and management should begin by taking stock of existing knowledge and local, national and international experience in a more systematic and detailed manner. Any such programme should be based on cooperation among several United Nations agencies, Governments, research institutions and non-governmental organizations. A comprehensive review of the state of land and water resources and of methods for addressing land degradation could provide a basis for priority-setting and action in five critical areas:

(a) World-wide monitoring and assessment of land degradation using remote sensing, GIS, and other technologies;

(b) Global information exchange on the experiences of countries in the integrated planning and management of land resources and in addressing land degradation;

(c) International cooperative efforts in capacity-building, transfer of technology, research and development, and investments to address critical problems of land degradation, including both prevention and rehabilitation;

(d) Capacity-building in policy-making and land-use management and awareness-raising at all levels of the causes and consequences of inadequate planning and management of land resources;

(e) Development, where appropriate, of international or eco-regional principles of sustainable land use, based on integrated approaches.

78. Capacity-building for improved land and water information, monitoring and assessment should be undertaken in parallel with the development of tools and methodologies for information analysis.[12]

79. To support national and international cooperative activities, United Nations inter-agency cooperation and collaboration with research institutions and non-governmental organizations in this field should be strengthened. Particular efforts should be made to expand and improve access to international databases and information systems on land use, land-use change and land degradation, for monitoring performance in attaining Agenda 21 goals and identifying further areas requiring priority attention. Cooperation among all concerned institutions is essential for addressing land use and related cross-sectoral issues that involve several agencies and for the development and implementation of joint activities for capacity-building and transfer of technology for integrated land-use planning and management.

*Notes*

[1] "Land" is a delineable area encompassing all attributes of the biosphere immediately above or below the earth's terrestrial surface, including the soil, terrain, surface hydrology, the near-surface climate, sediments and associated groundwater reserve, the biological resources, and the human settlement pattern and infrastructure resulting from human activity. This and other terms used in the present document are defined in FAO, "Terminology for integrated land resources planning and management" (1998).

[2] The "ecosystem approach" focuses not on spatial units or scale but on processes, functions and interactions within and between ecosystems, including interactions with human management practices, and on the goods and services they provide to humans.

[3] Centre for Environment and Development, University of Berne, Switzerland.

[4] The land quality indication concept, examples of possible indicators for specific regions, and some recommendations for their development are outlined in World Bank, "Discussion paper No. 315" (Washington, D.C.).

[5] Sustainable Agriculture and Natural Resource Management, College of Agricultural and Environmental Sciences, University of Georgia.

[6] The Popular Coalition, which resulted from an international conference by IFAD (Brussels, 1995), is a global consortium of intergovernmental organizations (IFAD, FAO, WFP, World Bank, EC), civil society and bilateral organizations.

[7] An FAO legal paper on the legal recognition of indigenous groups analyses how national laws recognize community-based land-owning or resource management groups and considers how to preserve cultural identity and local institutions while building the capacity of local groups.

[8] Rome, FAO, 1997.

[9] Rome, FAO, 1999.

[10] For example, "New concepts and approaches to land management in the tropics, with emphasis on steeplands" and "Land and crop management in the hilly terrains of Central America", *FAO Soils Bulletin*, Nos. 75 and 76; *Integrated Coastal Area Management and Agriculture, Fisheries and Forestry: FAO Guidelines* (Rome, FAO 1998).

[11] See FAO/UNEP, *Negotiating a Sustainable Future for Land* (Rome and Nairobi, 1997); Sara J. Scherr and Satya Yadav, "Land degradation in the developing world: implications for food, agriculture and environment to 2020". 2020 Vision Discussion Paper 14 (Washington, D.C., International Food Policy Research Institute, 1996).

[12] See "Land and water resources information systems", *Land and Water Bulletin*, No. 7 (1998).

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